Device and method for making up optical fibers

Claims

1. A device (1) for making up a multiplicity of synchronously produced individual optical fibers (2), in particular multicomponent glass fibers, from a multifiber drawing installation, with a drawing installation (3) and a take-up winder (4) for winding up the fibers (2) on a take-up spool (17), characterized in that the drawing installation (3) has means for producing an identical, constant drawing rate of the fibers (2) and in that the take-up winder (4) has a compensating device (5) to compensate for differences in speed of the fibers (2) between the drawing installation (3) and the take-up spool (17).

2. The device (1) as claimed in claim 1, characterized in that the fibers (2) can be brought together in the drawing installation (3) to form a fiber bundle.

3. The device (1) as claimed in either of claims 1 and 2, characterized in that the take-up winder (4) has a fiber guiding unit (19) and in that the fiber bundle (2) can be continuously displaced on the take-up spool (17) by means of the fiber guiding unit (19).

4. The device (1) as claimed in one or more of claims 1 to 3, characterized in that the fiber guiding unit (19) has at least one controllable excursion mechanism (22), which acts on a fiber guide (20) with a guiding roller (21) for laying the fibers over the take-up spool (17).

5. The device (1) as claimed in one or more of claims 1 to 4, characterized in that the take-up winder (4) has position-compensating means for adapting the fiber guiding unit (19) to the changing wound-up radius and/or for shortening the winding width of the layers of fiber on the take-up spool (17).

6. The device (1) as claimed in one or more of claims 1 to 5, characterized in that the position-compensating means has at least one controllable excursion mechanism (24), with which the traveling displacement of the fiber guide (20) and/or the guiding roller (21) is controllable in dependence on the number of fiber layers on the take-up spool (17) parallel and/or radially in relation to the axis of rotation of the take-up spool (17).

7. The device (1) as claimed in one or more of claims 1 to 6, characterized in that the compensating device (5) has means to compensate for the change in speed of the fiber bundle (2) when changing layers and/or on account of the changing wound-up radius of different layers on the take-up spool (17).

8. The device (1) as claimed in one or more of claims 1 to 7, characterized in that the means for compensating for the change in speed has a dancing arm (12), on which a deflection roller (13) for guiding the fiber bundle (2) is rotatably fastened and is held on the dancing arm (12) pivotably about the mounting point (14) of the dancing arm (12) on one side parallel to a plane of rotation of the take-up spool (17).

9. The device (1) as claimed in one or more of claims 1 to 8, characterized in that the deflection roller (13) and the take-up spool (17) have axes of

rotation that are substantially parallel to each other.

10. The device (1) as claimed in one or more of claims 1 to 9, characterized in that the deflection roller (13) is held on the dancing arm (12) in such a way that it can oscillate about the mounting point (14) in relation to the pivoting movement.

11. The device (1) as claimed in one or more of claims 1 to 10, characterized in that, to ensure a predetermined oscillating capability of the deflection roller (13) fastened to it, the dancing arm (12) is produced from elastic material with a predetermined modulus of elasticity, preferably from plastic.

12. The device (1) as claimed in one or more of claims 1 to 11, characterized in that, to ensure a predetermined oscillating capability of the deflection roller (13) fastened to it, the dancing arm (12) has a predetermined material thickness and/or form of material.

13. The device (1) as claimed in one or more of claims 1 to 12, characterized in that the dancing arm (12) has at the mounting point (14) an associated angular resolver, by means of which data on angles of rotation can be transmitted to a speed controller for controlling the take-up rate of the take-up spool (17).

14. The device (1) as claimed in one or more of claims 1 to 13, characterized in that the compensating device (5) for compensating for differences in speed and/or the position-compensating means for adapting the fiber guiding unit (19) can be

controlled by means of a central data processing unit.

15. The device (1) as claimed in one or more of claims 1 to 14, characterized in that the dancing arm (12) can be set in a position of equilibrium during the drawing and winding-up operation by means of a compensating force (F), preferably a pneumatic or hydraulic cylinder (15).

16. The device (1) as claimed in one or more of claims 1 to 15, characterized in that, if there is an interruption or abnormal termination of the drawing and taking-up operation, the dancing arm (12) can be made to travel into a neutral position by means of a compensating force (F), preferably a pneumatic or hydraulic cylinder (15).

17. The device (1) as claimed in one or more of claims 1 to 16, characterized in that a tension can be set in the fiber bundle (2) by means of the dancing arm (12), preferably by means of an adjustable pneumatic or hydraulic cylinder (15).

18. The device (1) as claimed in one or more of claims 1 to 17, characterized in that the take-up spool (17) is fastened in an exchangeable manner.

19. The device (1) as claimed in one or more of claims 1 to 18, characterized in that, for the exchange of the full take-up spool (17.1), a replacement spool (17.2) can be placed next to the full take-up spool (17.1) in the direction of the spool axis and in that the fiber guiding unit (19) can be made to travel over the replacement spool (17.2) or the replacement spool (17.2) can be made to travel under the fiber guiding unit (19) for the further laying of the fiber bundle (2).

20. The device (1) as claimed in one or more of claims 1 to 19, characterized in that, when changing the fiber bundle (2), the rotational speed of the replacement spool (17.2) can be controlled by closed-loop and/or open-loop control from the full take-up spool (17.1) by means of the compensating device (5) via the central data processing unit.

21. A method for making up a multiplicity of synchronously produced individual optical fibers (2) with a device (1) as claimed in one or more of claims 1 to 20, the fibers (2) being coated with size and bundled and passed via deflecting means to the take-up winder (4), characterized in that the compensating device (5) is used to compensate for differences in speed of the fiber bundle (2) between the drawing installation (3) and the take-up winder (4).

22. The method as claimed in claim 21, characterized in that compensation for changes in the take-up rate of the fiber bundle (2) on the take-up spool (17) is provided by the speed controller, by means of the data provided by the angular resolver, by changing the rotational speed of the take-up spool (17) and/or by transmitting to the speed controller a signal for stopping the take-up winder (4) corresponding to the neutral position of the dancing arm (12).

23. The method as claimed in either of claims 21 and 22, characterized in that, to produce a constant tensile stress, the individual fibers (2) are passed from the drawing installation (3) in band form over at least one sizing roller (8).

24. The method as claimed in one or more of claims 21 to 23, characterized in that the individual fibers (2) are drawn all together, with the same drawing rate in each case, by means of the drawing-off roller (6) and passed via a secondary roller (10) in a bundled manner to the take-up winder (4).

25. The method as claimed in one or more of claims 21 to 24, characterized in that the fiber bundle (2) is wound up on the take-up spool (17) layer by layer, preferably with an adjustable offset per layer, by means of the fiber guiding unit (19) via the guiding roller (21).

26. The method as claimed in claim 25, characterized in that the offset is fixed by the adjustable ratio of the number of excursions of the fiber guide (20) to the rotational speed of the take-up winder (4).

27. The method as claimed in one or more of claims 21 to 26, characterized in that the fiber guide (20) with the guiding roller (21) is made to travel cyclically back and forth parallel to the longitudinal axis of the spool by means of a controllable excursion mechanism (22) for the precise laying of the fibers (2) over the take-up spool (17).

28. The method as claimed in claim 27, characterized in that the winding width of the fiber layers on the take-up spool (17) is symmetrically shortened in dependence on the total number of layers by reducing the excursion of the fiber guide on both sides.

29. The method as claimed in one or more of claims 21 to 28, characterized in that, to ensure a constant distance between the guiding roller (21) and the

uppermost layer of the take-up spool (17), the fiber guide (20) with the guiding roller (21) is made to travel continuously radially with respect to the axis of rotation of the take-up spool (17) by means of a controllable excursion mechanism (24.

30. The method as claimed in claim 29, characterized in that the fiber guiding unit (19) is continuously adapted to the changing wound-up radius, in dependence on the total number of layers on the take-up spool (17).

31. The method as claimed in one or more of claims 21 to 30, characterized in that, for the exchange of the full take-up spool (17.1), a replacement spool (17.2) is placed next to the full take-up spool (17.1) on the spool axis.

32. The method as claimed in one or more of claims 21 to 31, characterized in that the fiber guiding unit (19) is moved over the replacement spool (17.2), preferably by means of a traveling table (18), when the spool is changed.

33. The method as claimed in one or more of claims 21 to 31, characterized in that the replacement spool (17.2) is moved under the fiber guiding unit (19) with simultaneous displacement of the take-up spool (17.1) when the spool is changed.

Device and method for making up optical fibers

Abstract

The invention relates to a device (1) and a method for making up a multiplicity of synchronously produced individual optical fibers (2), in particular multicomponent glass fibers, from a multifiber drawing installation, with a drawing installation (3) and a take-up winder (4) for winding up the fibers as a fiber bundle (2) on a take-up spool (17).

In order to produce and make up the fiber bundle (2) from a multiplicity of simultaneously drawn individual fibers (2) with little effort and at low cost while maintaining predetermined quality requirements, it is proposed according to the invention that the drawing installation (3) has means for producing an identical, constant drawing rate of the fibers (2) and that the take-up winder (4) has a compensating device (5) to compensate for differences in speed of the fibers (2) between the drawing installation (3) and the take-up spool (17).

This achieves the effect that each individual fiber (2) is produced under the same conditions. Fluctuations of the fiber diameter during production of the fibers (2) are avoided. An identical drawing rate of all the fibers (2) is made possible. The fibers (2) are passed at a substantially constant rate to the take-up winder (4) and further processed continuously. The speed of the drawing installation (3) is kept unchanged during the drawing of the fibers (2).

In an advantageous way, the fiber bundle (2) can be made up without any reaction on the drawing rate, thereby also avoiding reactions on the melting process.

figure 1